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Photovoltaic solar energy to reduce carbon dioxide emissions

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Abstract:

This study aims to highlight the role of solar photovoltaic energy in reducing carbon dioxide emissions, as the descriptive and analytical approach was relied upon.

Carbon dioxide emissions recorded a rapid increase during the period 1990-2022, and the countries of the world have concluded several international agreements regarding reducing them and keeping the earth's temperature below 1.5° C. which contributes to reducing carbon dioxide emissions.

✓ **Keywords :** Photovoltaic solar energy, Carbon dioxide gas, Global warming, Global agreements.
✓ **JEL Classification :** Q42 ; Q54.

1. INTRODUCTION :

Humans, through their reliance on depleted sources of energy in their various economic activities, have caused environmental damage, including carbon dioxide, which causes global warming. Rapide increases have been recorded in recent years. Therefore, the countries of the world have concluded many international conferences on reducing carbon dioxide emissions, such as the paris agreement. On climate change and the Cop 26,Cop 27, Cop 28, which resulted in the need for a global trend towards the exploitation of renewable energies, especially solar photovoltaic energy, as it i slow cost.

1.1 the researchh problem : Based on the above, the problem can be raised as follows

what is the role of solar photovoltaic energy in reducing carbon dioxide emissions ?.

1.2 Hybotheses : To address the research problem in the study, we relied on the following hypotheses :

- Carbon dioxide emissions have increased dramatically ;

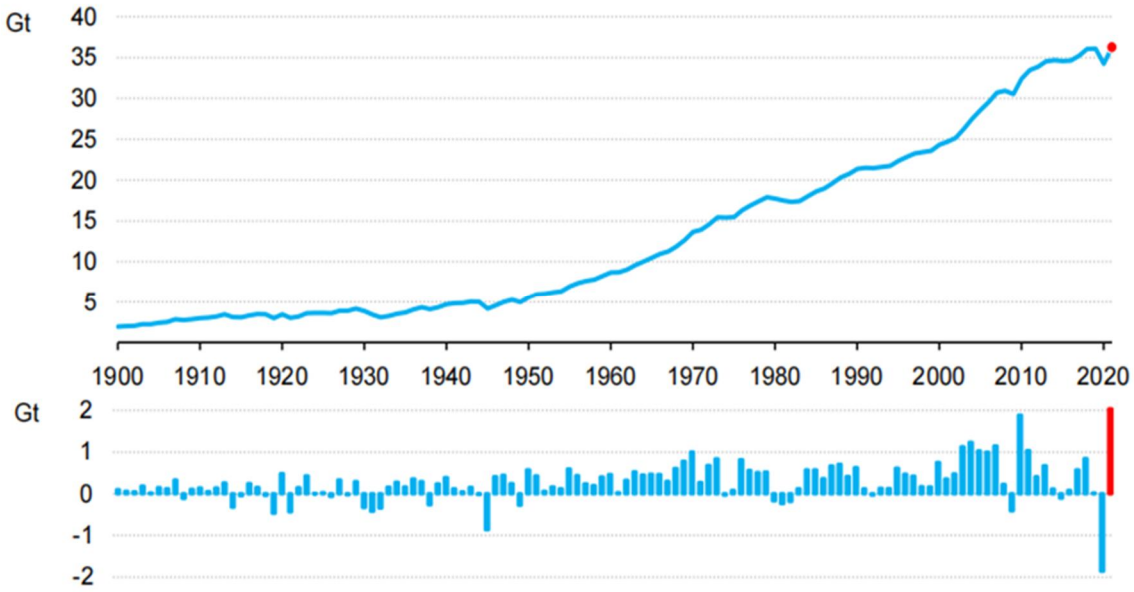
- Countries around the world have concluded many agreements on reducing carbon dioxide emissions ;

- The exploitation of photovoltaic solar energy recorded great developments globally.

2. Evolution of global carbon dioxide emissions :

Global carbon dioxide (CO2) emissions from energy combustion and industrial processes grow 0.9% or 321 Mt in 2022 to a new all time high of 36.8 Gt (iea, 2023, p. 5).

Fig.1. Global CO2 emissions from energy combustion and industrial processes and their annual change, 1990-2022 :



Source : IEA (International Energy Agency). (2022). *Global Energy Review : CO2 Emissions Rebound Sharply to Highest Ever Level*. France, p 3.

We note from figure 1 that carbon dioxide emissions have increased rapidly and continuously during the period 1990-2019, and this is due to the increased exploitation of depleted energy sources, to decrease after that in the years 2020 and 2021 due to the corona crisis, and the reason for this is due to the closure of the global supply chain of depleted energies, so that emissions rise year 2022.

2.1 The paris agreement 2015 :

The paris agreement (PA) defines a collective, long-term objective to hold the GHG-induced increase in temperature to well below 2° C celsius (C) and to pursue efforts to limit the temperature increase to 1.5° C above the pre-industrial level. As discussed below, a periodic « global stocktake » is to assess progress toward the goals (leggett, 2020, p. 6).

2.2 Cop 26 :

Cop 26 is an international climate change conference held under the uniter nationas framework convention on climate change (UNFCC)/ it stands for conference of the parties and is the 26th meeting of the parties to the (UNFCC). Cop 26 is ongoing and rune from 31 october to 12 november 2021. It is being held in glasgow under the UK's presidency and in partnership with italy.

Described by the UK government as « an event many believe to be the world's last best change to get runaway climate change under control », the conference will be attended by world leaders and many negotiators, government representatives, businesses, and citizens. The global of the conference are to (coleman, 2021, p. 1) :

-secure global net-zero by mid-century and keep 1.5 degrees within reach ;

-adapt to protect communities and natural habitats ;

-mobilise finance ;

-work together to deliver.

2.3 Cop 27 :

Cop 27 is the fifth conference of the parties (Cop) to be organised in africa since its inception in 1995. Ahead of this meeting, we-was health journal editors from across the continent-call for urgent action to ensure it is the Cop that finally delivers climate justice for africa and vulnerable countrise. This is essential not just for the health of those countries, but for the health of the whole world (Atwoli & and others, 2022, p. 1).

2.4 Cop 28 :

Natably, Cop 28 takes place in the UAE in 2023. It will be a global review hosted in a first ever gulf cooperation council (GCC) country, assessing whether national efforts will be sufficient to ulimately achieve 2050 emissions tragets. These are indispensable to limit global temperature increases. The UAE has an opportunity to demonstrate that greater collaboration with the private sector and private finance can deliver positive results, and must be included in decision-making as part of Cop 28's inner circle of key decision-make (Abu dhabi global market, 2022, p. 5).

Keeping the global temerature rise below 2 degrees celsius (°C) is technically feasible.it would also be more economically, socially and environmentally beneficial than the path resulting from current and pollcies. However, the global energy system must undergo a profound transformation, from one largely based on fossil fuels to one that enhances efficiency and is based on renewable energy. Such a global energy transformation-seen as the cuimination of the energy transition that is already happening in many countries-can create a world that is more prosperous and inclusive (IRENA, 2018, p. 8).

3. Exploiting photovoltaic solar energy globally :

Solar pv maintained its record-breaking streak, adding 175 GW of new capacity in 2021 to reach a cumulative total of around 942 GW.

Global capacity additions of centralised utility-scale solar pv increased around 20%, with 100 GW of new installations, driven by the economic competitiveness of solar power and the attractiveness of power purchase agreements. Utility-scale pv accounted for the majority of new installations in the united states, india, spain and France (REN 21, 2022, p. 28).

Table 1. Capacity Solar photovoltaic

year	2017	2018	2019	2020	2021	2022
CAP (mw) in the World	391280	486763	589429	721546	866027	1055030

Source : IRENA, Renewable energy statistics 2023, p 48.

We note from table 1 that the capacity of solar photovoltaic energy during the period 2017-2022 recorded a rapid and continuous growth globally, as it was estimated in 2017at 391280 mw, and in 2022 it reached 1055030 mw, which are significant values.

Table 2. Production from solar photovoltaic

year	2017	2018	2019	2020	2021
PROD (GWh) in the world	425961	550458	679387	829253	1020297

Source : IRENA, Renewable energy statistics 2023, p 49.

It appears from table 2 that the global production of photovoltaic solar energy recorded a rapid increase with significant values during the period 2017-2022, as its value ranged between 425961 and 1020297 GWh. The reason for this is due to the global trend towards exploiting renewable energies as an alternative energy source to harmful depleted energies environment, especially solar photovoltaic energy, due to its lower costs over time.

Table 3. Average annual Investment from solar photovoltaic

Year	2010	2018	2030	2050
(USD billion/yr)	77	144	165	192

Source :Irena, Future of solar photovoltaic, 2019, p 11.

From table 3, we can see that global investments in solar photovoltaic energy witnessed a rapid and continuous growth during the period 2010-2018, as it ranged between 77 and 144 USD billion/yr, and is expected to reach the horizons of 2030 and 2050, respectively, at a value of 165 and 192 USD billion/yr, due to its lower costs and in the long term.

Table 4. Levelized cost of electricity (LCOE) from solar pvfrom solar photovoltaic

Year	2010	2018	2030	2050
(USD billion/yr)	0.37	0.085	0.08-0.02	0.05-0.01

Source :Irena, Future of solar photovoltaic, 2019, p 11.

It is clear from table 4 that the costs of solar photovoltaic energy witnessed a rapid decline during the period 2010-2018 globally, from a value of 0.37 to 0.085 USD billion/yr, and it is expected to continue declining for the years 2030 and 2050, with values ranging between 0.02-0.08 and 0.05-0.01 USD billion/yr, respectively, due to the continuation of research and development in this field over time.

4. The role of solar photovoltaic energy in reducing CO2 emissions :

Pv played an important role in the reduction of the CO2 emissions from electricity in 2022, avoiding apparoximately 1399 Mt of annual CO2 emissions, up 30% from 2021. This is calculated as the emissions that would have been generated from the same amount of electricity produced by the different grid mixes in all countries and taking into consideration life cycle emissions of PV systems.

This amount of avoided CO2 emissions represents around 10% of the total electricity and heat sector emissions (+3% from 2021) and 4% of all energy emissions (iea, Snapshot of global pv Markets 2023, 2023, p. 18).

5. CONCLUSION :

The world has witnessed serious climate changes as a result of carbon dioxide emissions, which cause global warming significantly in recent years, which has increased the awareness of the countries of the world about this, as global efforts have been made, which were evident through the conclusion of several agreements in this regard, which resulted in the trend towards exploiting renewable energies, especially solar photovoltaic energy. This is due to its low costs and availability all over the world.

Through the study, the following results were reached:

- Carbon dioxide emissions decreased during the corona crisis as a result of the cessation of the fossil fuel supply chain and reliance on the exploitation of renewable energies ;

- The countries of the world have concluded many agreement on climate change to reduce carbon dioxide emissions, including the paris agreement in 2015, Cop 26, Cop 27, Cop 28 ;

- Global production of solar photovoltaic energy increased rapidly and continuously during the period 2017-2021 ;

- Global Investments in the field of solar photovoltaic energy recorded a continuous growth, as it is expected that by 2050 the value will reach 192 USD billion/yr

- Solar pv costs have decreased significantly and are expected to decrease by 2050 between 0.05-0.01 USD billion/yr ;

- Solar photovoltaic energy contributed to reducing carbon dioxide emissions by 1339 USD billion/yr.

- About 10% of the total carbon dioxide emissions of the electricity and heat sector

have been avoided by using solar photovoltaic energy and 4% of the total energy emissions.

Recommendations :

- Spreading awareness among the countries of the world for the optimal utilization of natural resources to reduce carbon pollution ;

- Use solar pv power supply ;

- Installing solar pv panels on the roof of houses to be used for heating and thermal heating.

6. Bibliography List :

Atwoli, L., & and others. (2022). Cop 27 climate change conference: urgent action needed for africa and the world. *pan american journal of public health*(46).

Abu dhabi global market. (2022). *UAE and the energy transition: towards COP28.* Abu dhabi, UAE.

Atwoli, L., & and others. (2022). Cop 27 climate change conference: urgent action needed for africa and the world. *pan american journal of public health*(46).

coleman, c. (2021). *cop 26: aims, goals and progress debat on 18 november 2021.* House of lords.

iea. (2023). *CO2 Emissions in 2022.* France.

iea. (2023). *Snapshot of global pv Markets 2023.*

IRENA. (2018). *Global energy transformation a roadmap to 2050.*

leggett, j. (2020). *The united nations framework convention on climate change, the kyoto protocol, and the paris agreement: a summary.* Congressional research service.

REN 21. (2022). *Renewables 2022 global status report.* France.